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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/835,392	LABELLE, LILIAN
	Examiner	Art Unit
	Kevin Siangchin	2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18 and 20-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-7,9-25,27-29 and 31* is/are rejected.

7)☒ Claim(s) *4,8,26 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 April 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4,7,9*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

Amendments

1. The preliminary amendment filed April 17, 2001 has been entered into the record. Claims 1-18 and 20-24 have been amended accordingly. Claims 25-31 have been added and Claim 19 removed, accordingly.

Drawings

Objections

2. The drawings are objected because of the following. Step S613, as illustrated in Fig. 6a, is not consistent with its description on page 21, line 24-26 of the applicant's specification. There the applicant indicates that, in step 631, the counter i is incremented and then its value is compared with the number *NB*. Fig. 6a, however, seems to indicate that $(i+1)$ is compared with the number *NB*. Similarly, step S627 in Fig. 6b is not consistent with the applicant's description on page 23, lines 23-25. Also in Fig. 6B, step S623 contains an expression *function(H(Q),H(Ds))*. The applicant has failed to provide a definition of *function()* anywhere in the disclosure. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claims

Rejections under U.S.C. § 112(2)

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 13 and 29 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 13 recites the limitation "...an isomorphism detection method applied to the quadtrees representing the second information items...". The portions of Claim 13 preceding this excerpt and claims 10-11, upon which claim 13 depends, do not make any claim to a quadtree or quadtrees or subject matter that admits to the existence or usage of a quadtree(s). Therefore, there is insufficient antecedent basis for this limitation in the claim.

6. Given the dependence of claim 29 on claim 13. Claim 29 is likewise rendered indefinite. An obvious choice to rectify this matter is to change the claim dependencies so that claim 13 is dependant on claim 29 and claim 29 dependant on claim 11. Claims 13 and 29 will, therefore, be treated as such henceforth in this document.

Rejections under U.S.C. § 102(b)

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claim 1-3, 5-7 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Chang et al. ("Extracting Multi-Dimensional Signal Features for Content-Based Visual Query").

9. *The following is in regard to Claim 1.* Chang et al. disclose a method of indexing a digital image (Chang et al. Abstract), comprising the following steps:

a. Generating a first information item characteristic of the visual content of the said image – e.g. any one of the feature sets derived from object texture, color, shape, and motion. See last paragraph on Chang et al. page P-1.

b. Generating a second information item characteristic of the spatial distribution of the visual content of the image in its image plane – e.g. feature vectors obtained by wavelet decomposition. See Chang et al. *Texture Discrimination* pp. P-3 to P-4. Transforms to wavelet domain provide spatial

frequency information associated with the input image. Quad-tree segmentation discussed on page Chang et al. page P-5 also addresses this limitation. See paragraph 4 on Chang et al. page P-5.

c. Associating, with the said image, an index composed of the said first information item and the said second information item. See last paragraph on Chang et al. page P-1.

It has thus been shown that the indexing method of Chang et al. conforms to that which the applicant claims in claim 1. Therefore, the indexing method proposed in applicant's claim 1 is anticipated by the teachings of Chang et al.

10. *The following is in regard to Claim 2.* As just shown, Chang et al. disclose a method of indexing that conforms to all limitations of claim 1. The digital image indexing method of Chang et al. comprises the generation of first information item, in accordance with item (a) above, further having the following substeps:

a (1). Dividing the image plane of the said image according to a partitioning comprising a predefined number N of blocks (i.e. quad-tree decomposition). See, for example, page P-5 of Chang et al. N is arbitrary.

a (2). Extracting, from each of the said blocks, a data item of a first type (e.g. color histogram) representing at least one characteristic of the visual content of the block under consideration. See, for example, paragraph 1 of *Quad-tree Based Color Histogram Indexing* on page P-7 of Chang et al.

a (3). Generating the said first information item as being a vector having N components, each of which is one of the said data items of the first type. See, for example, paragraph 1 of *Quad-tree Based Color Histogram Indexing* on page P-7 of Chang et al. The set of all histograms can be represented as a vector.

It has thus been shown that the indexing method of Chang et al. conforms to that which the applicant claims in claim 2. Therefore, the indexing method proposed in applicant's claim 2 is anticipated by the teachings of Chang et al.

11. *The following is in regard to Claim 3.* As just shown, Chang et al. disclose a method of indexing that conforms to all limitations of claim 2. The digital image indexing method of Chang et al. comprises the generation of second information item, in accordance with item (b) above, further having the following substeps:

b (1). Calculating, for each of the said blocks, a data item of a second type indicative of a degree of

significance of the visual content of the block under consideration with respect to the overall content of the said image. As mentioned, Chang et al. perform wavelet decomposition on the input image. Data of the wavelet transform domain is known to be indicative of the degree of visual significance of the corresponding image data (e.g. in the wavelet decomposition of Chang et al., low frequency subbands are visually significant).

b (2). Generating the said second information item as being a vector having N components, each of which is one of the said data items of the second type. See paragraph 1 of *Texture Discrimination* on page P-3 of Chang et al. The 16 dimensional feature vector can be interpreted as the second information item.

It has thus been shown that the indexing method of Chang et al. conforms to that which the applicant claims in claim 3. Therefore, the indexing method proposed in applicant's claim 3 is anticipated by the teachings of Chang et al.

12. *The following is in regard to Claim 5.* As just shown, Chang et al. disclose a method of indexing that conforms to the image indexing methods claimed in applicant's claims 1-3. Chang et al. further divide the image plane according to a rectangular grid. See Fig. 4(b) on page P-5 of Chang et al. Therefore, the teachings of Chang et al. address all limitations of claim 5.

13. *The following is in regard to Claim 6.* As just shown, Chang et al. disclose a method of indexing that conforms to the image indexing method claimed in applicant's claim 5. While Chang et al. do not constrain the decomposition of the image to any specific level or decomposition, a five-level decomposition is suggested. Such a decomposition yields 16 blocks. See Fig. 1 on page P-4 of Chang et al. Therefore, the teachings of Chang et al. address all limitations of claim 6.

14. *The following is in regard to Claim 7.* As shown above, Chang et al. disclose a method of indexing that conforms to the image indexing method claimed in applicant's claim 2. The method of Chang et al. further comprises:

d. Dividing the image plane according to a quadtree decomposition process by means of which, at each phase of the decomposition, a block under consideration (referred to hereinafter as the "parent block") is decomposed into four blocks (referred to hereinafter as "child blocks") equal in size to a quarter the size of the parent block, and whose combination gives the parent block, said

decomposition beginning with the overall image plane of the said image (Im) and finishing when the predefined number N of blocks is reached. This is consistent with conventional wavelet decomposition of some predetermined level. See *Texture Discrimination*, paragraph 1 on page P-3 of Chang et al. and Fig. 2 on page P-4.

e. At each phase of the decomposition, there is calculated, for each of the said child blocks, a data item of a second type, indicative of a degree of significance of the visual content of the child block under consideration with respect to the overall visual content of the parent block. As seen in Chang et al. Fig.1 each node contains data indicative of the subband energy. This data is taken here to represent the second data type. As mentioned above, with regard to claim 3, this information provides an indication as to the visual significance of the subband (represented by the child block).

f. The said second information item is composed of the set of the said data items of the second type stored according to a quadtree structure, each node of which is constituted by one of the said data items of the second type. See the remarks above, with regard to item b(2).

It has thus been shown that the indexing method of Chang et al. conforms to that which the applicant claims in claim 7. Therefore, the indexing method proposed in applicant's claim 7 is anticipated by the teachings of Chang et al.

15. *The following is in regard to Claim 9.* As shown above, Chang et al. disclose a method of indexing that conforms to the image indexing methods claimed in applicant's claim 1-3. Chang et al. calculates, for each block of the decomposed image, an individual color histogram. See paragraph 1 of *Quad-Tree Based Color Histogram Indexing* on page P-7 of Chang et al. Color histograms are known to indicate the color distribution within an image or section of an image. In this way,

16. *The following is in regard to Claim 10.* As shown above, Chang et al. disclose a method of indexing that conforms to the image indexing methods claimed in applicant's claim 1. Chang et al. integrate their method of indexing into an content-based visual querying (CBVQ) system. The visual databases of this system are indexed by the fundamental feature sets discussed above. As in other conventional CBVQ systems, the feature set corresponding to the query image is used to query the visual database. This should be clear from the discussion in

paragraph 2 of *Introduction* on page P-1 of Chang et al. and Sections 3-4 of Chang et al. In this way, the teachings of Chang et al. address all limitations of claim 10 and are thus anticipatory.

17. *The following is in regard to claims 17-24.* Clearly, the method of image indexing proposed by Chang et al. can be implemented on a digital data processing device, or as a computer program resident on some computer readable medium. Therefore, with regard to claims 17-24, remarks analogous to those presented above relating to claims 1-3, 7 and 10 are applicable.

Rejections under U.S.C. § 103(a)

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. Claims 11, 12, 14, 25, 27, and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. in view of Smith et al. ("Quad-Tree Segmentation for Texture-Based Image Query").

20. *The following is in regard to Claim 11.* As shown above, Chang et al. disclose a method of searching for images that is accordance with that which the applicant claims in claim 10. Chang et al., however, do not disclose the details of this method of searching beyond those elements of their CBVQ system conforming to claim 10. Specifically, Chang et al. do not show a method of searching for images that further comprises:

a. Calculating a first similarity between the said example image and each of the images amongst a predefined plurality of stored images, the said first similarity being calculated from the said second information items associated respectively with the said example image and the stored image under consideration.

b. Providing a first subset of images selected from amongst the said predefined plurality of images according to their degree of first similarity with the said example image.

c. Calculating a second similarity between the said example image and each of the images amongst the said first subset of selected images, the said second similarity being calculated from the said first information items associated respectively with the said example image and the selected image under consideration.

d. Providing at least one image referred to as a result image, the said at least one result image being selected from amongst the said first subset of selected images, according to its degree of second similarity with the said example image.

21. Smith et al., on the other hand, show a method of searching for images comprising:

a. Calculating a first similarity between the said example image (hereinafter, referred to interchangeably as Q) and each of the images (hereinafter, referred to interchangeably as D) amongst a predefined plurality of stored images (e.g. Mahalanobis distance between textures features – Section 4.1 on page 4 of Smith et al.), the said first similarity being calculated from the said second information items associated respectively with the said example image and the stored image under consideration. As in Chang et al., the texture features are the obtained by wavelet decomposition of the image and, thus, correspond to the second information item described above in relation to claim 1. See that discussion and Figure 2 on page 3 of Smith et al.

b. Providing a first subset of images selected from amongst the said predefined plurality of images according to their degree of first similarity with the said example image. See Section 6.1 on pages 6-7 of Smith et al.

Smith et al. use a hierarchical searching scheme to search the feature space for matching images. This involves a successive refinement of the set of matching database images (match list) that is based, correspondingly, on the successive evaluation of the similarities (e.g. a first similarity, a second similarity, a third similarity, and so on) between the example image and the database images along each of the dimensions of the feature space. See Section 6.1 on page 6-7 of Smith et al. Taking this into account, the method of Smith et al. further involves:

c. Calculating a second similarity between the said example image and each of the images amongst the said first subset of selected images.

d. Providing at least one image referred to as a result image, the said at least one result image being selected from amongst the said first subset of selected images, according to its degree of second similarity with the said example image.

22. Smith and Chang have incorporated the teachings of "Extracting Multi-Dimensional Signal Features for Content-Based Visual Query" (Chang et al.) and "Quad-Tree Segmentation for Texture-Based Image Query" (Smith et al.) into their Video On-Demand Testbed at Columbia University, thus demonstrating the combination of those teachings. See paragraph 1 of *Prototype and Testbed* on page P-9 of Chang et al. and Section 7.1 on page 7 of Smith et al. Given this, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to combine the teachings Chang et al. and Smith et al.

23. Notice that, while Smith et al. teaches the calculation of a second similarity between the said example image and each of the images amongst the said first subset of selected images (item (d) above), they do not explicitly specify that the said second similarity are calculated from the said first information items associated respectively with the said example image and the selected image under consideration. Smith et al., however, does mention that truncation of the match list be done according to the *significance* of the feature space dimension. See Section 6.1 on page 7 of Smith et al. Given this, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to calculate the second similarity from the said first information items associated respectively with the said example image and the selected image under consideration. One is particularly motivated to do so when confronted with the feature set discussed in Chang et al. (namely the first information type – e.g. any one of the feature sets derived from object texture, color, shape, and motion (see discussion above with regard to claim 1 item (a); and the second information type – e.g. feature vectors obtained by wavelet decomposition (see discussion above with regard to claim 1 item (b))). The first information type (e.g. any one of the feature sets derived from object texture, color, shape, and motion) provides a more precise indication of the similarity of two images than the second information type (e.g. feature vectors obtained by wavelet decomposition). Choosing to calculate the second similarity using the first information type would thus be in accordance with the teachings of Smith et al. Modifying, in this manner, the method of searching for images, obtained by combining the teachings of Smith et al. and Chang et al. in the manner discussed above , yields a method of searching for images that conforms to claim 11.

24. *The following is in regard to Claim 12.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 11. The step of calculating the first similarity in the method of Smith et al. is implemented by calculating a distance (e.g. Mahalanobis distance between textures features – Section 4.1 on page 4 of Smith et al.) between the second information item associated with example image and the second information item associated with the said stored image under consideration. In this way, the teachings of Chang et al. and Smith et al., when combined in the manner described above, yield a method of searching for image that conforms to all the limitations of claim 12.

25. *The following is in regard to Claim 14.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claims 11-12. Neither Chang et al. nor Smith et al. explicitly show that the aforementioned second similarity is calculated based on a distance between the first information item associated with the said example image and the first information item associated with the said stored image under consideration. However, it would have been obvious to use the same distance metric used to measure the similarity between first information items associated, respectively, with the example image and the multitude of database images. Distance metrics, such as the Mahalanobis distance, are frequently used in content-based image retrieval/querying applications to measure the similarity between feature vectors. Again, since Smith et al. uses a hierarchical search scheme, this distance would be calculated for the truncated match list (see the discussion above relating to claim 11). Taking this into account, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to calculate a distance metric, such as the Mahalanobis distance, between the example image and each of the images in the truncated match list of Smith et al., and to use this distance as a measure of the similarity between these two sets of images. By extending the method of searching, obtained by combining the teachings of Chang et al. and Smith et al. in the manner discussed above, one would obtain a method of searching for images that conforms to all limitations of claim 14.

26. *The following is in regard to Claim 25.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 12. As shown above, with regard to claim 3, Chang et al. teach a digital image indexing method comprising the generation of the second information further having the following substeps:

b (1). Calculating, for each of the said blocks, a data item of a second type indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the said image. As mentioned, Chang et al. perform wavelet decomposition on the input image. Data of the wavelet transform domain is known to be indicative of the degree of visual significance of the corresponding image data (e.g. in the wavelet decomposition of Chang et al., low frequency subbands are visually significant).

b (2). Generating the said second information item as being a vector having N components, each of which is one of the said data items of the second type. See paragraph 1 of *Texture Discrimination* on page P-3 of Chang et al. The 16 dimensional feature vector can be interpreted as the second information item.

Therefore, given the discussion above relating to claims 3 and 12, it should be clear that the teachings of Chang et al. and Smith et al., when combined in the manner described above, yield a method of searching for image that conforms to all the limitations of claim 25.

27. *The following is in regard to Claim 27.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 12. As shown above, with regard to claim 5, Chang et al. teach a digital image indexing method wherein the image plane of the image is divided according to a rectangular grid. Therefore, given the discussion above relating to claim 5 and 12, it should be clear that the teachings of Chang et al. and Smith et al., when combined in the manner described above, yield a method of searching for image that conforms to all the limitations of claim 27.

28. *The following is in regard to Claim 28.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 27. As shown above, with regard to claim 6, Chang et al. teach a digital image indexing method wherein the predefined number N of blocks is equal to sixteen. Therefore, given the discussion above relating to claim 6 and 12, it should be clear that the teachings of Chang et al. and Smith et al., when combined in the manner described above, yield a method of searching for image that conforms to all the limitations of claim 28.

29. *The following is in regard to is in regard to Claim 29.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 11. As shown above, with regard to claim 7, the method of indexing of Chang et al. further includes:

d. Dividing the image plane according to a quadtree decomposition process by means of which, at each phase of the decomposition, a block under consideration (referred to hereinafter as the "parent block") is decomposed into four blocks (referred to hereinafter as "child blocks") equal in size to a quarter the size of the parent block, and whose combination gives the parent block, said decomposition beginning with the overall image plane of the said image (Im) and finishing when the predefined number N of blocks is reached. This is consistent with conventional wavelet decomposition of some predetermined level. See *Texture Discrimination*, paragraph 1 on page P-3 of Chang et al. and Fig. 2 on page P-4.

e. At each phase of the decomposition, there is calculated, for each of the said child blocks, a data item of a second type, indicative of a degree of significance of the visual content of the child block under consideration with respect to the overall visual content of the parent block. As seen in Chang et al. Fig.1 each node contains data indicative of the subband energy. This data is taken here to represent the second data type. As mentioned above, with regard to claim 3, this information provides an indication as to the visual significance of the subband (represented by the child block).

f. The said second information item is composed of the set of the said data items of the second type stored according to a quadtree structure, each node of which is constituted by one of the said data items of the second type. See the remarks above, with regard to item b(2).

Therefore, given the discussion above relating to claims 7 and 11, it should be clear that the teachings of Chang et al. and Smith et al., when combined in the manner described above, yield a method of searching for image that conforms to all the limitations of claim 29.

30. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. in view of Smith et al., as applied to claim 11 above, in further view of Folkers ("Pictorial Query Specification and Processing").

31. *The following is in regard to Claim 13.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 29. Chang et al. and Smith et al. do not, however, teach that the calculation of the first similarity be implemented by an isomorphism detection method applied to the quadtrees representing the said second information items associated respectively with the said example image and the stored image under consideration.

32. Folkers teaches an algorithm which evaluates the spatial similarity between a query image, represented as a query graph, and a set of database images, each being represented by a database image graph. In this algorithm, spatial similarity is determined by matching those database images having database image graphs that are isomorphic to the query graph. See Algorithm 3.2.1 and its explanation in Section 3.3.1 on page 17 of Folkers.

33. Quadtrees are graphs and, as a result, Folkers algorithm is applicable to the evaluation of the isomorphism of quadtrees, such as those of the aforementioned example images and database images. Quadtrees that are not similar are likely to represent substantially different images. Therefore, Folkers algorithm provides means to evaluate the similarity of the example image and each of the database images. Taking this into account, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use the subgraph isomorphic matching algorithm of Folkers to evaluate the isomorphism of the quadtrees corresponding to the example image and each of the database images, and to use this evaluation, as Folker does, to determine an initial similarity between the example image and the database images. In doing so, one would obtain a method of searching for images that conforms to all limitations of claim 13.

34. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. in view of Smith et al., as applied to claim 11 above, in further view of Smith ("Integrates Spatial and Feature Image Systems: Retrieval Analysis and Compression").

35. *The following is in regard to Claim 15.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. in such a way as to satisfy all the limitations of claim 14. Neither Chang et al. nor Smith et al. teach that the step of calculating the said second similarity is implemented by calculating the sum of the distances

between each of the components of the first information item associated with the example image and the corresponding component of the first information item associated with the stored image under consideration.

36. Smith teaches a CBVQ system that includes evaluating the similarity between a query image or, more specifically, its color histogram and that of a target image (i.e. one image of a multitude of database images). Recall that a color histogram is interpreted here as representing a first information item (see the discussion above relating to claim 1). Smith suggests several approaches to this evaluation including the computation of the Minkowski-form distance. See equation (4.2) on page 47 of Smith and the first entry of Table 4.1 on page 48. It is clear from this equation that the Minkowsi metric of Smith's application is the sum of the distances between each of the components of the first information item associated with the example image and the corresponding component of the first information item associated with the stored image under consideration.

37. As shown in Figure 4-3 on page 48 of Smith, the Minkowski metric provides an effective measure of the similarity (or dissimilarity) between the example (query) image and each of the database (target) images. Taking this into account and Smith's demonstrated usage of the Minkowski metric in a CVBQ system, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use this distance metric to measure the aforementioned second similarity. In doing so, one obtains a method of search for images that satisfies all limitations of claim 15.

38. *The following is in regard to Claim 16.* As shown above, the teachings of Chang et al. can be combined with those of Smith et al. and Smith in such a way as to satisfy all the limitations of claim 15. As mentioned in the previous discussion, Smith measures the similarity between the *color histograms* of the example image and the database images. Smith further teaches measuring the this similarity by computing the sum of histogram intersections between the respective color histogram components. See equation (4.4) on page 48 of Smith. The histogram intersection allows one to find known objects (e.g. as defined by the example image) within images using color histograms. See paragraph 1 of Section 4.3.1.1 on page 48 of Smith. Taking this into account and the discussion above relative to claim 15, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use the histogram intersection to measure the aforementioned second similarity. In doing so, one obtains a method of search for images that satisfies all limitations of claim 16.

39. *The following is in regard to Claims 18, 23-24 and 31.* Clearly, a method of image searching can be implemented on a digital data processing device, or as a computer program resident on some computer readable medium. Therefore, with regard to claims 18, 23-24 and 31, remarks analogous to those presented above relating to claims 10-13 are applicable.

Allowable Subject Matter

Objections, Allowable Subject Matter

40. Claims 4, 8, 26, and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

41. The following is a statement of reasons for the indication of allowable subject matter.

42. *The following is in regard to Claims 4 and 26.* Prior art was not found to show a method of indexing where for each of the said blocks, the said data item of a second type, indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the said image, is obtained by applying the following formula:

$$w_i^{\mathrm{Im}} = \frac{\left\| h_i^{\mathrm{Im}} \right\|}{\sum_{i=1}^{N} \left\| h_i^{\mathrm{Im}} \right\|} \qquad (41.1)$$

according to which the said data item of the second type (w_i^{Im}) is obtained by calculating the ratio between the Euclidean norm of the data item (h_i^{Im}) of the first type associated with the block (B_{ij}) under consideration and the sum of the Euclidean norms of the data items of the first type associated with all the blocks of the image (Im). Prior art CBVQ/CBIR systems were encountered, however, that use data items having a form similar to equation (41.1) and are likewise indicative of the degree of significance of the visual content of an image block obtained by a wavelet decomposition. While prior art methods are similar in this regard, the data used to evaluate this expression in the prior art methods is not of the first type (e.g. color histogram data). See [1]

43. *The following is in regard to Claims 8 and 30.* Similarly, prior art was not found to show an image indexing method where the said data item (w_i^p) of the second type indicative of a degree of significance of the visual content of a child block under consideration with respect to the overall visual content of the corresponding parent block is obtained by applying the following formula:

$$w_i^p = \frac{\left\| h_f^p \right\|}{\left\| h_p \right\|} \tag{42.1}$$

according to which the said data item of the second type (w_i^p) calculated for a child block under consideration is obtained by calculating the ratio between the Euclidean norm of the data item (h_f^p) of the first type extracted for the said child block under consideration and the Euclidean norm of the data item (h_p) of the first type extracted from the corresponding parent block.

Citation of Relevant Prior Art

44. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure

[1] Liang and Kuo. *Waveguide: A Joint Wavelet-Based Image Representation and Description System.* November 1999 IEEE Transactions on Image Processing.

Liang and Kuo essentially addresses the subject matter claimed in applicant's claims 1-3, 5-7, 9-15. Note that equation (1) on page 1621 of Liang and Kuo is similar in form and function to the equation (41.1) above. In particular, this equation provides a measure of the relative energy of a feature vector associated with a child node (subband) of a quadtree image decomposition to the total energy of all subbands. Equation (41.1) above is also a measure of the relative energy of a child block. The difference between the two expressions are the specific types of data being evaluated.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Siangchin whose telephone number is (703)305-7569. The examiner can normally be reached on 9:00am - 5:30pm, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Examiner
Art Unit 2623

ks – 04/01/04

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